

Case 3010

Proposed conservation of usage of 15 mammal specific names based on wild species which are antedated by or contemporary with those based on domestic animals

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Abstract. The purpose of this application is to conserve the usage of 15 specific names for mammals which are distinct from those of their domestic derivatives and which postdate or are contemporary with the latter. A number of systems have been devised for the naming of domestic animals but none has gained universal acceptance. Many taxa first described and named by Linnaeus (1758, 1766) and other authors were either based on domestic animals or encompassed both the wild and domestic forms. The majority of domestic animals and their wild ancestors continue to share the same name but in a few cases a tradition has arisen under which the domestic and wild forms are separately named. Among these are 15 mammals in which the name for the domestic form antedates or is contemporary with that of the wild ancestor and this name has been applied by a minority of authors to the wild species, creating confusion in the literature. It is proposed that majority usage be confirmed by adoption of the first available specific name based on a wild population for the following wild taxa: *Equus africanus* Heuglin & Fitzinger, 1866 (ass), *E. ferus* Boddaert, 1785 (tarpan), *Camelus ferus* Przewalski, 1883 (Bactrian camel), *Camelus* (currently *Lama*) *guanicoe* Müller, [1776] (guanaco), *Camelus* (currently *Vicugna*) *vicugna* Molina, 1782 (vicuña), *Bos primigenius* Bojanus, 1827 (aurochs), *B. gaurus* H. Smith, 1827 (gaur), *B.* (currently *Bubalus*) *arnee* Kerr, 1792 (water buffalo), *Poephagus* (currently *Bos*) *mutus* Przewalski, 1883 (yak), *Capra aegagrus* Erxleben, 1777 (bezoar), *Ovis orientalis* Gmelin, 1774 (Asian mouflon), *Cavia aperea* Erxleben 1777 (guinea pig), *Canis lupus* Linnaeus, 1758 (wolf) *Mustela putorius* Linnaeus, 1758 (polecat) and *Felis silvestris* Schreber, [1777] (wildcat).

Keywords. Nomenclature; taxonomy; Mammalia; *Equus africanus*; *Equus ferus*; *Camelus ferus*; *Lama guanicoe*; *Vicugna vicugna*; *Bos primigenius*; *Bos gaurus*; *Bubalus arnee*; *Bos mutus*; *Capra aegagrus*; *Ovis orientalis*; *Cavia aperea*; *Canis lupus*; *Mustela putorius*; *Felis silvestris*; domestic animal names.

1. The first evidence for the domestication of a wild animal, that of the wolf, is dated between 12000 and 14000 years ago, and the earliest known domestic food animals were goats around 9000 years ago. There is little, if any, evidence that the cultivation of plants began earlier than 7000–8000 years ago, after the end of the last glacial period (see Hillman, Colledge & Harris, 1989, p. 265). Mason (1984, p. vii) considered that a domestic animal, in its most developed form, shows four main characteristics: (1) its breeding is under human control; (2) it provides a product or service useful to man; (3) it is tame; (4) it has been selected away from the wild type. The concept of domestication was further defined by Gautier (1990): 'It is a microevolutionary process and a form of cultural control over animals, implying that these creatures are forced to live and multiply in captivity; as a result they acquire domestic traits' (see also various papers in Clutton-Brock, Ed., 1989). Not all animals considered to be 'domestic' qualify under all the criteria, and archaeologists and anthropologists have demonstrated many different stages intermediate between wild species and their domestic derivatives (see, for example, Wing, 1993 and references cited in her paper). Van Gelder (1969, p. 151) also drew a distinction between modern 'domestic' animals (populations that differ from their ancestral stocks through selection by man) and 'domesticates' (individuals that are tame and 'of the home'). The ultimate distinguishing feature of a domestic animal is the presence of a range of genotypes produced by artificial selection. It is now generally accepted that most domestic animals are monophyletic stocks, each with a single wild ancestor. Some animals which have been domesticated for a long time remain very similar to the wild type (the rabbit, Bali cattle and the water buffalo, for example) and all domestic forms retain the genetic ability to breed with the wild species if that is extant (see, for example, Stains, 1975 for dog/wolf; Novoa & Wheeler, 1984 for llama and alpaca/guanaco and Morris, 1993 for ferret/polecat and domestic cat/wildcat).

2. Domestic animals do not fall into a recognised and consistent system of taxonomy (see Clutton-Brock, 1987; Gautier, 1993; and Groves, 1995) and zoologists and archaeozoologists have been discussing their naming for many years. Many taxa first described and named by Linnaeus (1758, 1766) and a few other authors were either based on domestic animals or encompassed both the wild species and domestic forms. The great majority of wild species and their domestic derivatives share the same name (e.g. *Oryctolagus cuniculus* (Linnaeus, 1758) for the wild and the domestic rabbit, *Myocastor coypus* Molina, 1782 for the wild coypu and the domestic nutria, *Anas platyrhynchos* Linnaeus, 1758 for the mallard and the domestic duck, and *Columba livia* Gmelin, 1789 for the rock dove and the domestic pigeon; see Corbet & Clutton-Brock, 1984 and Clutton-Brock, 1987), but some 18 domestic forms have names which are traditionally distinct from those applied to their wild ancestors (see Groves, 1995; those for mammals are set out in the Table, p. 34). Of these, 15 domestic mammals have names which antedate or are contemporary with those for the wild species and a few authors have applied these names to the wild species. This has caused problems and confusion in zoology and especially in archaeozoology where the distinction between wild species, domestic forms and intermediate stages is crucial.

3. The creation of Latin names for domestic animals was fashionable for many decades in the 19th and early 20th centuries and a plethora of names in the literature resulted. The nomenclatural treatment of these names (as species, subspecies, races or

breeds) was inconsistent, both between authors and within the works of the same author. Ellerman & Morrison-Scott (1951), for example, treated the wild and domestic forms of the gaur as separate species, *Bos gaurus* and *B. frontalis*; the wild yak as a subspecies, *B. grunniens mutus*, of the domestic; and the wild and domestic forms of the water buffalo as conspecific, *Bubalus bubalis*. More recently, attempts have been made to achieve consistency in the naming of domestic animals and a number of nomenclatural systems have been devised. These were summarised and discussed by Gautier (1993); the most notable are mentioned here. Bohlken (1958, 1961) proposed that priority should be suspended for the nomenclature of domestic animals; he labelled them with the specific name of the wild ancestor followed by the name of the domestic form where this had been separately named. In order to indicate that domestic animals were not 'natural' subspecies he added the word 'forma' and treated the trinomial as infrasubspecific (e.g. '*Bos primigenius* forma *taurus*'). This system was adopted by Herre & Röhrs (1990) and various European authors, including Zeuner (1963). Dennler de la Tour (1959, 1968) also considered that priority should not apply to the names of domestic animals and proposed that they be labelled with the name of the wild ancestor followed by 'familiaris' to denote their status (e.g. *Bos primigenius* 'familiaris').

4. In response to the inconsistency of treatment in the two systems by then proposed to deal with the naming of domestic animals (para. 3 above), neither of which was in accord with the Code, and the danger of a proliferation of such systems, one of us (C.P.G.) submitted an application to the Commission (BZN 27: 269–272; March 1971) which sought to exclude from the Code names based on domestic animals. Groves proposed that wild species should be referred to by the first available name based on a wild population, whilst vernacular names only would be used for domestic animals (e.g. '*Bos* (domestic cattle)'). Comments on the application were received from eight authors; those from five were published (BZN 28: 77–78, 140 (1971); 29: 108 (1972); 36: 5–10 (1979)). All the commentators opposed the proposal on practical grounds: (a) there are difficulties in interpreting the meaning and boundaries of the word 'domestic' (see para. 1 above) and it would be difficult to decide which names were to be treated as outside the scope of zoological nomenclature; (b) as noted above (para. 2), relatively few names based on domestic forms are distinct from those applicable to their wild ancestors. The majority of wild species and their domestic derivatives share the same name, which may well have been based on domestic forms. If 'domestic' names were excluded from nomenclature under the Code all these names would be affected. Additionally, if excluded from the Code, the 'domestic' names could, formally, be re-used for different taxa, leading to considerable confusion. The application eventually lapsed. Nearly all the commentators, and also Richard Melville (former Secretary to the Commission) in his summing-up (BZN 34: 139–140; November 1977), advocated bringing an application to the Commission to deal individually with the names for wild species which are distinct from and are contemporary with or postdate those for domestic animals. There has been no application until now.

5. The inconsistent treatment of the names for domestic animals has continued until the present day. Following Groves's (1971) application a number of authors (Clutton-Brock, Corbet & Hills, 1976; Corbet, 1978; Cockerill, 1984) urged that names for domestic forms should be vernacular only. Odening (1979), however,

treating domestic animals and their wild ancestors as conspecific, proposed that the earliest available name for the two components should be adopted, domestic animals being indicated by the notation 'hemerotype' and wild species by 'agriotype' (e.g. '*Felis catus*' would denote both wild and domestic cats, '*F. catus agriot.*' all wildcats, and '*F. catus hemerot.*' all domestic cats). Where the ancestor of the domestic form was not known separate names would be used for the wild species and domestic form. Corbet & Clutton-Brock (1984) recommended that Linnaean names be used for domestic animals as if separate from the wild species but in quotation marks to indicate their status (e.g. *Canis* '*familiaris*'). Clutton-Brock (1987) subsequently used names based on domestic animals as valid for domestic forms, and applied the first available names based on wild species to the wild taxa. Gautier (1993) proposed that domestic animals be treated as subspecies of wild species and named accordingly, whilst in the same volume Uerpmann (1993) proposed that domestic animals should be denoted by a single Latin word printed in capitals and italics (e.g. *ALPACA*, *BOS*, *BANTENG*, *CABALLUS*, *LAMA*).

6. In his compilation of mammalian genera and families Palmer (1904) recorded the type species designations made by earlier authors. In a number of cases the types are domestic animals. The generic names *Bos* and *Ovis* were placed on the Official List in Opinion 75 (January 1922), *Canis*, *Capra* and *Felis* in Opinion 91 (October 1926). The type species of these genera (*Bos taurus*, *Ovis aries*, *Canis familiaris*, *Capra hircus* and *Felis catus* respectively, in accord with Palmer's 1904 citations) were placed on the Official List in Direction 22 (November 1955). The specific name of *Mustela putorius* (type species of *Putorius* Cuvier, [1816], placed on the Official List in Opinion 91) was also placed on the Official List in Direction 22. *Equus* and its type species, *E. caballus*, were placed on Official Lists in Opinion 271 (September 1954). The specific names of *Felis silvestris* and *Bos gaurus* were placed on the Official List in Opinions 465 (May 1957) and 1348 (September 1985) respectively. Palmer (1904), following the designation of Hay (1902), cited *Camelus dromedarius* Linnaeus, 1758, the domestic Arabian camel, as the type species of *Camelus*. A misleading statement in Opinion 16 (July 1910) has resulted in subsequent authors (see, for example, Allen, 1939 and Ellerman & Morrison-Scott, 1951) citing *bactrianus* as the type, disregarding Hay's designation. Both *dromedarius* and *bactrianus* are currently included in *Camelus*; none of the names *Camelus*, *dromedarius* or *bactrianus* has been placed on an Official List.

7. Notwithstanding the continuing discussions on what should be the approved nomenclature of domestic animals (paras. 2–5 above), for those with distinct names the naming of their wild ancestors has been relatively stable in recent years. Most authors have adopted the first available name based on the wild species as valid for the taxon (see the Table, p. 34). The names have appeared in current checklists and reference works (see, for example, Corbet, 1978; Corbet & Hill, 1991, 1992; Nowak, 1991, some names) and numerous publications on biology, ecology, behaviour and conservation, as well as taxonomy. Recent representative works in which the names have been used include Groves (1974, 1986), Kingdon (1979, 1982), Stuart (1982), Martin & Klein (1984), Uerpmann (1987), Skinner & Smithers (1990), Harrison & Bates (1991), Morey (1994) and Wheeler (1995). The first available name based on the wild species has also been adopted for endangered taxa in the (1993) 1994 IUCN *Red List of Threatened Animals*, and in legal documentation relating to the conservation

and management of protected species (see, for example, CITES Appendices I-III (Convention on International Trade in Endangered Species of Wild Fauna and Flora)).

8. The new (1993) edition of *Mammal species of the world*, edited by Wilson & Reeder, is an exception to majority usage. In the chapters on the Perissodactyla and the Artiodactyla names have been used for wild species irrespective of whether they were first described on a wild or a domestic form. Thus the Linnaean names *Equus asinus* and *E. caballus* are used for both the wild and domestic forms of ass and horse respectively, and *Bos taurus* is used for the aurochs, with *B. primigenius* Bojanus, 1827 included as a synonym. Similarly, *Ovis aries* and *Capra hircus* are given as the valid names for the wild progenitors of sheep and goats, which usually appear as *Ovis orientalis* Gmelin, 1774 and *Capra aegagrus* Erxleben, 1777 in archaeozoological publications and current checklists (such as Corbet & Hill, 1991). Editorial policy was to adopt the earliest name (see the Introduction, p. 9) but this has not been used for taxa in other chapters of the volume where, for example, the Linnaean name for the domestic cat, *Felis catus*, is cited as a synonym of *F. silvestris* Schreber, [1777], the wild cat, and the Linnaean name *Cavia porcellus* is restricted to the domestic form of the guinea pig. The use for wild species of names that were first described on domestic forms is a retrograde step that will confuse not only biologists, palaeontologists, archaeologists and those in applied fields (ecology, conservation, behaviour studies and physiological research) but also customs officials who have the job of sorting out illegal imports of endangered species. They would find it difficult to impound a trophy head of a wild sheep if it carries the name of *Ovis aries*. In their review of the Wilson & Reeder volume Corbet & Hill (1994) criticised both the unaccustomed inclusion for these taxa of the domestic form and the wild species under the same name and the inconsistency of treatment in different groups. They noted: 'The ambiguities ... could easily be avoided by excluding the domestic forms from the wild species'.

9. In accord with the great majority of usage for the 15 mammal taxa listed in the Table (p. 34), we now propose that the usage for wild taxa of the first available names based on wild species should be conserved. Our proposal was discussed and endorsed by the Executive Committee of the International Council of Archaeozoology at a meeting (July 1995) in Cambridge, U.K., and by a meeting (September 1995) of the ICAZ in Basle.

10. Two non-mammalian taxa, *Cyprinus* (currently *Carassius*) *gibelio* Bloch, 1782, the Prussian or gibel carp widely spread from Central Europe to East Asia, and *Theophila* (currently *Bombyx*) *mandarina* Moore, 1872, the mulberry silk moth from China, Korea and Japan, traditionally have distinct names which postdate those of the derived domestic forms, *Carassius auratus* (Linnaeus, 1758), the goldfish, and *Bombyx mori* (Linnaeus, 1758), the silkworm. To our knowledge there is no confusion in the use of these names and we have therefore not proposed Commission action to protect the name of the wild species. Aquarist publications such as Axelrod & Vorderwinkler (1976, p. 163) have used *Carassius auratus* for the ornamental fish; Sterba (Ed., 1983, p. 117) used *C.a. auratus* and *C.a. gibelio* for the aquarium fish and wild species respectively. Chinery (1973, pp. 166, 191) used the name *Bombyx mori* for the domestic silkworm; Tazima (1984, p. 417) used *B. mandarina* for the wild species of mulberry silk moth and *B. mori* for the domestic form. *Phalaena mori*

Linnaeus, 1758 was designated the type species of *Bombyx* Linnaeus, 1758 and placed on the Official List in Opinion 450 (March 1957).

11. The International Commission on Zoological Nomenclature is accordingly asked:

- (1) to use its plenary powers to rule that the name for each of the wild species listed in (2) and (3) below is not invalid by virtue of being antedated by a name based on a domestic form;
- (2) to place on the Official List of Specific Names in Zoology the following names, together with an endorsement to record the ruling in (1) above:
 - (a) *africanus* Heuglin & Fitzinger, 1866, as published in the binomen *Equus africanus*;
 - (b) *ferus* Boddaert, 1785, as published in the binomen *Equus ferus*;
 - (c) *ferus* Przewalski, 1883, as published in the trinomen *Camelus bactrianus ferus*;
 - (d) *guanicoe* Müller, [1776], as published in the binomen *Camelus guanicoe*;
 - (e) *vicugna* Molina, 1782, as published in the binomen *Camelus vicugna*;
 - (f) *primigenius* Bojanus, 1827, as published in the binomen *Bos primigenius*;
 - (g) *arnee* Kerr, 1792, as published in the binomen *Bos arnee*;
 - (h) *mutus* Przewalski, 1883, as published in the binomen *Poephagus mutus*;
 - (i) *aegagrus* Erxleben, 1777, as published in the binomen *Capra aegagrus*;
 - (j) *orientalis* Gmelin, 1774, as published in the binomen *Ovis orientalis*;
 - (k) *aperea* Erxleben, 1777, as published in the binomen *Cavia aperea*;
 - (l) *lupus* Linnaeus, 1758, as published in the binomen *Canis lupus*;
- (3) to add to the entries for the following specific names on the Official List of Specific Names in Zoology an endorsement to record the ruling in (1) above:
 - (a) *gaurus* H. Smith, 1827, as published in the binomen *Bos gaurus*;
 - (b) *putorius* Linnaeus, 1758, as published in the binomen *Mustela putorius*;
 - (c) *silvestris* Schreber, [1777], as published in the trinomen *Felis catus silvestris*.

Table. Mammal wild species and their domestic derivatives which traditionally have separate names

Wild species	Domestic form
Perrisodactyla	
<i>Equus africanus</i> Heuglin & Fitzinger, 1866 (p. 588)	<i>Equus asinus</i> Linnaeus, 1758 (p. 73)
North African wild ass	Donkey
<i>Equus ferus</i> Boddaert, 1785 (p. 159)	<i>Equus caballus</i> Linnaeus, 1758 (p. 73)
Russian wild horse, tarpan	Domestic horse
Artiodactyla	
<i>Camelus bactrianus ferus</i> Przewalski, 1883 (p. 43, pl. opposite p. 42)	<i>Camelus bactrianus</i> Linnaeus, 1758 (p. 65)
Wild Bactrian camel, now restricted to the western Gobi desert	Domestic Bactrian camel
<i>Camelus guanicoe</i> Müller, [1776] (p. 50)	<i>Camelus glama</i> Linnaeus, 1758 (p. 65)
South American guanaco	Llama
¹ <i>Camelus vicugna</i> Molina, 1782 (p. 313)	<i>Camelus pacos</i> Linnaeus, 1758 (p. 66)
South American vicuña	Alpaca
<i>Bos primigenius</i> Bojanus, 1827 (p. 477, pl. 24)	<i>Bos taurus</i> Linnaeus, 1758 (p. 71) (including <i>B. indicus</i> Linnaeus, 1758, p. 72)
Aurochs of Europe, Asia and North Africa, extinct since 1627	Common cattle (including zebu)
<i>Bos gaurus</i> H. Smith, 1827 (p. 399)	<i>Bos frontalis</i> Lambert, 1804 (p. 57)
Gaur of India, Burma and Malaya	Gaur, mithan
<i>Bos arnee</i> Kerr, 1792 (p. 336, figs. opposite pp. 295, 336)	<i>Bos bubalis</i> Linnaeus, 1758 (p. 72)
Indian water buffalo, arni	Domestic water buffalo
<i>Poephagus mutus</i> Przewalski, 1883 (p. 191, pl. opposite p. 190)	<i>Bos grunniens</i> Linnaeus, 1766 (p. 99)
Asian yak	Domestic yak
<i>Capra aegagrus</i> Erxleben, 1777 (p. 260)	<i>Capra hircus</i> Linnaeus, 1758 (p. 68)
Bezoar of the Middle East	Domestic goat
<i>Ovis orientalis</i> Gmelin, 1774 (pp. 432, 486, pl. 15)	<i>Ovis aries</i> Linnaeus, 1758 (p. 70)
Mouflon of Western Asia	Domestic sheep (including European mouflon; see Uerpmann, 1981)
² <i>Sus scrofa</i> Linnaeus, 1758 (p. 49)	<i>Sus domesticus</i> Erxleben, 1777 (p. 179)
Eurasian wild boar	Domestic pig
Rodentia	
<i>Cavia aperea</i> Erxleben, 1777 (p. 348)	<i>Mus porcellus</i> Linnaeus, 1758 (p. 59)
South American cavy	Domestic guinea pig
Carnivora	
<i>Canis lupus</i> Linnaeus, 1758 (p. 39)	<i>Canis familiaris</i> Linnaeus, 1758 (p. 38)
Wolf of the Palaearctic, India and North America	Dog (including dingo)
<i>Mustela putorius</i> Linnaeus, 1758 (p. 46)	<i>Mustelo furo</i> Linnaeus, 1758 (p. 46)
Polecat of Europe, Middle East and Morocco	Ferret
<i>Felis catus silvestris</i> Schreber, [1777], (p. 39)	<i>Felis catus</i> Linnaeus, 1758 (p. 42)
Wildcat of Western Europe to Western China and Central India, much of Africa	Domestic cat

¹There is some archaeological evidence that the domestic alpaca *Camelus pacos* Linnaeus, 1758 has been derived from the wild South American vicuña *Camelus vicugna* Molina, 1782 (see Wheeler, 1995). However, comparison of living domestic animals with the wild species has led other researchers to different conclusions. Whatever the final outcome on the ancestry of the alpaca we propose that the usage of the specific name *vicuena* be conserved for the vicuña.

The name *Sus scrofa* Linnaeus, 1758 for the wild boar predates that for the domestic form, *S. domesticus* Erxleben, 1777, and Commission action is therefore not required to secure the name. *Sus* was placed on the Official List in Opinion 75, and the type species *S. scrofa* in Direction 22.

References

- Allen, G.M. 1939. A checklist of African mammals. *Bulletin of the Museum of Comparative Zoology at Harvard College*, 83: 1–763.
- Axelrod, H.R. & Vorderwinkler, W. 1976. *Encyclopedia of tropical fishes with special emphasis on techniques of breeding*, Ed. 23. 631 pp. T.F.H. Publications, Neptune City, New Jersey.
- Bloch, M.E. 1782. *Oeconomische Naturgeschichte der Fische Deutschlands*, vol. 1. Berlin.
- Boddaert, P. 1785. *Elenchus Animalium*, vol. 1 (Sistens Quadrupedia). Pp. 43–174. Rotterdam.
- Bohlken, H. 1958. Zur Nomenklature der Haustiere. *Zoologischer Anzeiger*, 160(7–8): 167–168.
- Bohlken, H. 1961. Haustiere und zoologische Systematik. *Zeitschrift für Tierzüchtung und Züchtungsbiologie*, 76: 107–113.
- Bojanus, L.H. 1827. De Uro nostrate eiusque sceleto commentatio. Scripsit et Bovis primigenii sceleto auxit. *Nova Acta Physico-Medica Academiae Caesareae Leopoldino Carolinae*, 13(2): 411–478.
- Chinery, M. 1973. *A field guide to the insects of Britain and northern Europe*. 352 pp., 60 pls. Collins, London.
- Clutton-Brock, J. 1987. Appendix 1: nomenclature of the domestic mammals. Pp. 194–197 in: *A natural history of domesticated mammals*. 208 pp. British Museum (Natural History), London.
- Clutton-Brock, J. (Ed.). 1989. *The walking larder. Patterns of domestication, pastoralism, and predation*. xxii, 368 pp. Unwin Hyman, London.
- Clutton-Brock, J., Corbet, G.B. & Hills, M. 1976. A review of the family Canidae, with a classification by numerical methods. *Bulletin of the British Museum (Natural History)*, Zoology, 29(3): 119–199.
- Cockerill, W.R. (Ed.). 1984. *The camelid. An all-purpose animal*, vol. 1. 544 pp., 5 pls. Scandinavian Institute of African Studies, Uppsala.
- Corbet, G.B. 1978. *The mammals of the Palearctic region: a taxonomic review*. 314 pp. British Museum (Natural History), London.
- Corbet, G.B. & Clutton-Brock, J. 1984. Appendix: taxonomy and nomenclature. Pp. 434–438 in Mason, I.L. (Ed.), *Evolution of domesticated animals*. 452 pp. Longman, London.
- Corbet, G.B. & Hill, J.E. 1991. *A world list of mammalian species*, Ed. 3. viii, 243 pp. Natural History Museum, London.
- Corbet, G.B. & Hill, J.E. 1992. *The mammals of the Indomalayan region: a systematic review*. 488 pp., 45 figs., 177 maps. Oxford University Press, Oxford.
- Corbet, G.B. & Hill, J.E. 1994. Review: Wilson, D.E. and D.M. Reeder (eds.). 1993. *Mammal species of the world: a taxonomic and geographic reference*, 2nd Edition. The view from the Old World. *Journal of Mammalogy*, 75(1): 239–243.
- Dennler de La Tour, G. 1959. La descendencia del perro. *Act. Congr. Sudamer. de Zool.*, 4: 215–223.
- Dennler de La Tour, G. 1968. Zur Frage der Haustier-Nomenklatur. *Säugetierkundliche Mitteilungen*, 16: 1–20.
- Ellerman, J.R. & Morrison-Scott, T.C.S. 1951. *Checklist of Palearctic and Indian mammals 1758 to 1946*. 810 pp. British Museum (Natural History), London.
- Erxleben, J.C.B. 1777. *Systema regni animalis ... Classis I (Mammalia)*. xlviii, 636 pp. Lipsiae.
- Gautier, A. 1990. *La domestication. Et l'homme créa ses animaux*. Errance, Paris.
- Gautier, A. 1993. 'What's in a name?'. A short history of the Latin and other labels proposed for domestic animals. Pp. 91–98 in Clason, A., Payne, S. & Uepmann, H.-P. (Eds.), *Skeletons in her cupboard. Festschrift for Juliet Clutton-Brock*. 259 pp. Oxbow Monograph no. 34.
- Gmelin, S.G. 1774. *Reise durch Russland zur Untersuchung der drey Natur-Reiche*, vol. 3. 508 pp., 57 pls. St Petersburg.
- Groombridge, B. (Ed.). 1993. 1994 IUCN Red List of Threatened Animals. lvi, 286 pp. IUCN — The World Conservation Monitoring Centre, Gland, Switzerland.
- Groves, C.P. 1971. Request for a declaration modifying Article 1 so as to exclude names proposed for domestic animals from zoological nomenclature. *Bulletin of Zoological Nomenclature*, 27(5/6): 269–272.

- Groves, C.P. 1974. *Horses, asses and zebras in the wild*. 192 pp. David & Charles, London.
- Groves, C.P. 1986. The taxonomy, distribution, and adaptations of Recent equids. Pp. 11–65 in Meadow, R.H. & Uerpmann, H.-P. (Eds.), *Equids in the Ancient World*. Reichert, Wiesbaden.
- Groves, C.P. 1995. On the nomenclature of domestic animals. *Bulletin of Zoological Nomenclature*, 52(2): 137–141.
- Harrison, D.L. & Bates, P.J.J. 1991. *The mammals of Arabia*, Ed. 2. xvi, 354 pp. Harrison Zoological Museum, Sevenoaks.
- Hay, O.P. 1902. Bibliography and catalogue of the fossil Vertebrata of North America. *Bulletin of the United States Geological Survey*, 179: 1–868.
- Herre, W. & Rohrs, M. 1990. *Haustier — zoologisch gesehen*. Fischer, Stuttgart.
- Heuglin, T. von & Fitzinger, L.J. 1866. Systematische Übersicht der Säugethiere Nordost-Afrika's mit Einschluss der arabischen Küste, des rothen Meeres, der Somäli- und der Nilquellen-Länder, südwärts bis zum vierten Grade nördlicher Breite. *Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften. Mathematisch-Naturwissenschaftliche Classe*, 54: 537–611.
- Hillman, G.C., Colledge, S.M. & Harris, D.R. 1989. Plant-food economy during the Epipalaeolithic period at Tell Abu Hureyra, Syria: dietary diversity, seasonality, and modes of exploitation. Pp. 240–268 in Harris, D.R. & Hillman, G.C. (Eds.), *Foraging and farming. The evolution of plant exploitation*. xxxiii, 733 pp. Unwin Hyman, London.
- Kerr, R. 1792. *The animal kingdom or zoological system of the celebrated Sir Charles Linnaeus*, vol. 1, part 1 (Mammalia). xli, 400 pp. Murray, London.
- Kingdon, J. 1979, 1982. *East African mammals. An atlas of evolution in Africa*, vol. 3, part B (Large mammals), pp. 125–179 (*Equus*) (1979); part C (Bovids), pp. 52–55 (Bovini) (1982). Academic Press, London.
- Lambert, A.B. 1804. Description of *Bos frontalis*, a new species, from India. *Transactions of the Linnean Society of London*, 7: 57–59.
- Linnaeus, C. 1758. *Systema naturae*, Ed. 10, vol. 1. 824 pp. Salvii, Holmiae.
- Linnaeus, C. 1766. *Systema naturae*, Ed. 12, part 1. 530 pp. Salvii, Holmiae.
- Martin, P.S. & Klein, R.G. 1984. *Quaternary extinctions. A prehistoric revolution*. x, 892 pp. University of Arizona Press, Tucson.
- Mason, I.L. (Ed.). 1984. *Evolution of domesticated animals*. 452 pp. Longman, London.
- Molina, J.I. 1782. *Saggio sulle storia naturale del Chile*. Bologna.
- Moore, F. 1872. Descriptions of new Indian Lepidoptera. *Proceedings of the Zoological Society of London*, 1872: 555–583.
- Morey, D.F. 1994. The early evolution of the domestic dog. *American Scientist*, 82(4): 336–347.
- Morris, P.A. 1993. British mammals — their status, research needs and likely future. *Mammal Review*, 23(3/4): 167–176.
- Müller, P.L.S. [1776]. *Des Ritters Carl von Linné ... voustandigen Natursystems*. Supplements und Register. Nürnberg.
- Novoa, C. & Wheeler, J.C. 1984. Lama and alpaca. Pp. 116–128 in Mason, I.L. (Ed.), *Evolution of domesticated animals*. 452 pp. Longman, London.
- Nowak, R.M. 1991. *Walker's mammals of the world*, Ed. 5. 1629 pp. (in 2 vols.). Johns Hopkins University Press, Baltimore & London.
- Odenig, K. 1979. Zur Taxonomie und Benennung der Haustier. *Zoologische Garten*, N.F. 49: 89–103.
- Palmer, T.S. 1904. *Index Generum Mammalium: a list of the genera and families of mammals*. 984 pp. North American Fauna No. 23. U.S. Department of Agriculture, Washington.
- Przewalski, N.M. 1883. *Third journey in Central Asia. From Zaisan through Khamsi into Tibet and to the sources of the Yellow River*. iv, ii, 473 pp., unnumbered plates, maps. St Petersburg. [In Russian].
- Schreber, J.C.D. von. [1777]. *Die Säugthiere in Abbildungen nach der Natur, mit Beschreibungen*, vol. 3. Pp. 283–590, pls. 81–166. Leipzig.
- Skinner, J.D. & Smithers, R.H.N. 1990. *The mammals of the Southern African subregion*, Ed. 2. xxxii, 769 pp., 37 pls. University of Pretoria, Pretoria.

- [Smith, C.H.] 1827. The Ruminantia. Vol. 4 in Griffith, E., Smith, C.H. & Pidgeon, E. (Eds.), *The animal kingdom arranged in conformity with its organisation, by the Baron Cuvier, with additional descriptions of all the species hitherto named, and of many not before noticed*. 498 pp., unnumbered plates. Whittaker, London.
- Stains, H.J. 1975. Distribution and taxonomy of the canids. Pp. 3–26 in Fox, M.W. (Ed.), *The wild canids. Their systematics, behavioral ecology and evolution*. xvi, 508 pp. Van Nostrand Reinhold, New York.
- Sterba, G. (Ed.). 1983. *The aquarist's encyclopedia*. [English version edited by Mills, D.; first published 1978 in German].
- Stuart, A.J. 1982. Pleistocene vertebrates in the British Isles. 212 pp. Longman, London.
- Tazima, Y. 1984. Silkworm moths. Pp. 416–424 in Mason, I.L. (Ed.), *Evolution of domesticated animals*. 452 pp. Longman, London.
- Uerpmann, H.-P. 1981. *Ovis musimon* Schreber, 1782 oder *Ovis musimon* Pallas, 1814? *Säugetierkundliche Mitteilungen*, **29**(4): 59–60.
- Uerpmann, H.-P. 1987. *The ancient distribution of ungulate mammals in the Middle East. Fauna and archaeological sites in Southwest Asia and Northeast Africa*. 173 pp. Reichert, Wiesbaden.
- Uerpmann, H.-P. 1993. Proposal for a separate nomenclature of domestic animals. Pp. 239–241 in Clason, A., Payne, S. & Uerpmann, H.-P. (Eds.), *Skeletons in her cupboard. Festschrift for Juliet Clutton-Brock*. 259 pp. Oxbow Monograph no. 34.
- Van Gelder, R.G. 1969. *Biology of mammals*. 197 pp. Scribner, New York.
- Wheeler, J.C. 1995. Evolution and present situation of the South American Camelidae. *Biological Journal of the Linnean Society*, **54**(3): 271–295.
- Wilson, D.E. & Reeder, D.A.M. (Eds.). 1993. *Mammal species of the world. A taxonomic and geographic reference*, Ed. 2. xviii, 1206 pp. Smithsonian Institution Press, Washington & London.
- Wing, E.S. 1993. The realm between wild and domestic. Pp. 243–250 in Clason, A., Payne, S. & Uerpmann, H.-P. (Eds.), *Skeletons in her cupboard. Festschrift for Juliet Clutton-Brock*. 259 pp. Oxbow Monograph no. 34.
- Zeuner, F.E. 1963. Summary. Man and cattle. Proceedings of a symposium on domestication. *Occasional Paper of the Royal Anthropological Institute (London)*, **18**: 158–166.